



The Potential Clinical Utility of Intravascular Ultrasound Guidance in Patients Undergoing Percutaneous Coronary Intervention With Drug-Eluting Stents

This monthly column in Cath Lab Digest reviews important points of distinction in drug-eluting stents (DES), from characteristics to techniques, so that physicians have valuable and relevant information about this revolutionary technology.

By Lowell F. Satler, MD

Dr. Lowell Satler, Director of Interventional Cardiology at the Washington Hospital Center, practices cardiology, internal medicine, and interventional cardiology in Washington, D.C. He is well-renowned in the application of new coronary device developments in interventional cardiology. Dr. Lowell Satler has been practicing for 30 years.

Q Recently, the Washington Hospital Center presented a unique analysis on the clinical impact of intravascular ultrasound (IVUS) on drug-eluting stent (DES) placement at the 2007 annual meeting of the American Heart Association. What was the objective for this novel analysis?

A DES have proven to be highly effective in reducing restenosis compared to bare-metal stents. Despite this, DES are not free of restenosis and are subject to stent thrombosis. IVUS has suggested that sub-optimal stent deployment is a significant etiology underlying both DES restenosis and thrombosis. Given the importance of optimal stent deployment in proper stent expansion and apposition to the vessel wall, it was intuitive that IVUS guidance should yield a clinical benefit. As a result, we examined the hypothesis that IVUS-guided percutaneous coronary intervention (PCI) with DES yields clinical benefit in terms of stent thrombosis and rate of major adverse cardiac events (MACE).

Q What was the design of the study?

A We evaluated more than 1,700 DES patients at the Washington Hospital Center. Approximately half of these patients had IVUS-guided DES implantation and half had DES implantation guided only by angiography. Clinical follow-up was conducted at 30 days and one year. The patient groups were well matched in terms of their complexity. Pre-dilatation was less frequent in the no-IVUS group compared to the IVUS group (60 percent vs. 72 percent), whereas post-dilatation, rotational atherectomy and use of the Cutting Balloon® device was more common in the IVUS group.

Q What conclusions came from this study? Which did you find particularly interesting?

A There were reduced thrombosis and repeat revascularization rates in the IVUS-guided cohort, suggesting that IVUS-guided DES implantation has the potential to influence treatment strategy. We further concluded that IVUS guidance should be considered for routine use during DES

implantation in patients at an increased risk for these events. When we compared IVUS-guided PCI to angiographic-guided PCI, we found the cumulative rate of stent thrombosis at 30 days was 0.5 percent in the IVUS-guided group and 1.4 percent in the no-IVUS group ($p=0.045$). At one year, we continued to see an important trend, particularly with the rate of definite stent thrombosis, which was 0.7 percent in the IVUS group and 2.0 percent in the no-IVUS group ($p=0.014$). Target lesion revascularization was slightly higher in the no-IVUS group (7.2 percent vs. 5.1 percent; $p=0.06$), although this was not statistically significant.

Q What are some ways you feel the information gained by IVUS-guided DES placement may have led to improved clinical outcomes in this study?

A When you can visualize optimal stent expansion and full lesion coverage, you may often eliminate some of the pathology associated with a higher incidence of stent thrombosis, such as sub-optimal expansion, lack of complete apposition and presence of occult distal dissections. This allows improvement in implantation techniques, which may be in part responsible for decreased rates of stent thrombosis.

IVUS also allows you to get an accurate assessment of tissue type and local plaque morphology, giving you the advantage of better tool selection and helping to optimize the final result.

Q What percentage of the time do you feel IVUS gives you valuable information that was not appreciated on angiography?

A It depends on your experience with stenting, but I think that 30 percent of the time, IVUS adds information beyond angiography that can help optimize the outcome. For example, IVUS makes it easier to assess vessel size and lesion length. Furthermore, it provides information on the degree of calcium in a plaque prior to treatment, which might encourage the use of ablative technologies to improve stent delivery.

Q How have the results from this study influenced the use of IVUS and DES at the Washington Hospital Center, and what role do you see IVUS playing in the future?

A I think our results encourage the lower-volume operators at our center to use IVUS more frequently. This will probably impact the percentage of patients we evaluate with IVUS, even in a center in which IVUS is already used in greater than 70 percent of lesions.

Q What advances have you seen in IVUS technology over the last several years?

A We have seen a dramatic improvement in image quality. I particularly like the Boston Scientific system because it gives very good gray-scale characteristics. Lower-profile catheters now feature improved deliverability, and interpretation software has become more automated and faster. Finally, the incorporation of IVUS as a permanent part of the cath lab should increase a user's comfort level with the technology and help them to use it more efficiently.

Q Do you see any clinical relevance with tissue characterization?

A Not yet. Most of the data are very speculative, and it is still too early to determine what this technology has to offer. Currently, I would much rather have a higher-resolution, better grayscale image with which I can characterize plaque morphology than a multi-colored image that cannot be used to predict outcomes.

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